Developing Reforestation Technology for Southern Pines: A Historical Perspective

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Abstract

Early in the 20th century, the forests of the South were decimated by aggressive harvesting, resulting in millions of acres of forest land in need of reforestation. Foresighted individuals committed efforts to restore this harvested land to a productive condition. The effort required dedication, cooperation, and leadership. The efforts of this small cadre of individuals resulted in successful restoration of the South's forests and these new forests became the basis of the South's economy.

The Need for Reforestation

As late as the 1870s, millions of acres of virgin longleaf pine (*Pinus palustris* Mill.) forests covered the South's Coastal Plain from the Carolinas to east Texas. During the late 1800s and early 1900s, however, massive timber harvest on this forest land occurred. The dire economic conditions after the Civil War allowed for procurement of vast areas of timber land with low investments. The development of steam-powered logging and milling equipment resulted in the establishment of the huge lumbering industry. The area of clear-cut forests in the southern Coastal Plain equaled the combined areas of Alabama, Mississippi, and Louisiana—about 92 million ac (37 million ha) (Heyward 1958).

The mass timber harvest has been described as the golden age of lumbering and did much to provide for the economic recovery of the South, but, after the timber was removed, a spirit of desolation and bleakness returned (figure 1). Few individuals could envision how forested conditions could be restored within a timeframe that could be economically practical, because the harvested pine stands had been 150 years old or older. Even if reforestation had been practical, Wakeley (1930) estimated that, based on the then-rate of planting, it would take up to 1,000 years to reforest the Nation's denuded forest land.

Recognizing Reforestation's Economic Potential

In the 1910s, Henry E. Hardtner of the Urania Lumber Company (Urania, LA) believed that an economic opportunity existed in developing second-growth forests and worked to convince others of the economic potential of reforestation (Burns 1978). Hardtner invited Professor H.H. Chapman of the Yale University School of Forestry to bring his forestry students to Urania for the school's annual 3-month spring camp. Beginning in 1917, and continuing for several decades, Chapman led his students at Urania in developing novel concepts for determining growth possibilities, evaluating the role of fire in longleaf pine establishment, and using periodic controlled burning as a means of suppressing hardwood competition (Barnett 2011).

Austin Cary, a Forest Service employee from the Washington, DC, office, traveled the South in the early 1900s and did much through his pithy ways to convince lumbermen of the value of second-growth stands (White 1961). He was known to charge into a lumber company president's office and take him to the woods. With his ever-present axe, he would cut trees to show the rapid growth rate of young pine stands.

Hardtner, Chapman, Cary, and other pioneers demonstrated that reforestation was economically viable. But, tree nurseries and technology to reforest these massive areas of depleted forest land were needed to successfully achieve reforestation goals.

Figure 1. This cut-over forest land was typical of millions of acres of land across the South in the early 20th century. (Photo from USDA Forest Service files)

Early Development of Nursery and Reforestation Technology

In 1908, the Great Southern Lumber Company began operation at Bogalusa, LA, and established the world's largest sawmill, with four 8-foot band saws producing 1 million board feet of lumber every 24 hours (Heyward 1963). W.H. Sullivan, general manager of the company, visited with Hardtner at Urania and decided to begin a reforestation program. In 1919, Sullivan assigned J.T. Johnson as forester in charge of reforestation. Johnson had no formal forestry training, but he "contributed an immeasurable quality of skill, labor and ingenuity to building the South's great pine forests" (Wakeley 1976). Johnson established a one-half acre pine seedling nursery during 1921–22 across from the Bogalusa City Hall—believed to be the first pine seedling nursery in the South (Wakeley and Barnett 2011). Larger nurseries soon followed.

Johnson was fortunate to have F.O. "Red" Bateman as his assistant. Bateman was the company's head ranger (figure 2). With only a 9th-grade education, Bateman became the prime mover in developing nursery and planting principles and techniques for the southern pines. By the time Philip C. Wakeley (figure 3) was hired in 1924 by the recently established USDA Forest Service Southern Forest Experiment Station and assigned to Bogalusa to begin a reforestation cooperative program, Bateman had worked out general principles still employed today, such as slit planting of bareroot seedlings grown at moderate seedbed densities in the nursery without shade (Wakeley 1976). He also developed a planting dibble that is still in use today and established a 6-ft by 8-ft outplanting spacing that became the nearly universal planting density standard used throughout the South for decades.

When Philip Wakeley began his research, the Southern Forest Experiment Station had been in existence for only 3 years. At the time, fewer than 20 professionally trained foresters were working across the entire South (Wakeley and Barnett 2011). Wakeley's intensive collaborative effort to understand and develop southern pine seed collection and processing, seedling nursery culture, and planting technology was applied to the entire southern Coastal Plain from east Texas to the Carolinas (figure 3).

Before the Great Depression caused the Great Southern Lumber Company to go into receivership in the early 1930s, Bateman had planted 12,700 ac (5,140 ha) of southern pines. With the exception of the Biltmore Estate near Asheville, NC, no other successful pine plantations in the South had more than 100 ac (40 ha) (Wakeley and Barnett 2011). White pine (*Pinus strobus* L.) seedlings grown in Europe had been imported to establish the Biltmore plantations (Schenck 2011).

An example of Red Bateman's ingenuity was the development of a nursery seeding tool for longleaf pine seeds. Wakeley expressed his frustration one morning at the inability to drill sow longleaf pine seeds because of their persistent seed coat

Figure 2. F.O. (Red) Bateman of the Great Southern Lumber Company developed many southern nursery practices still in use today. (Photo by C.W. Goodyear, 1929)

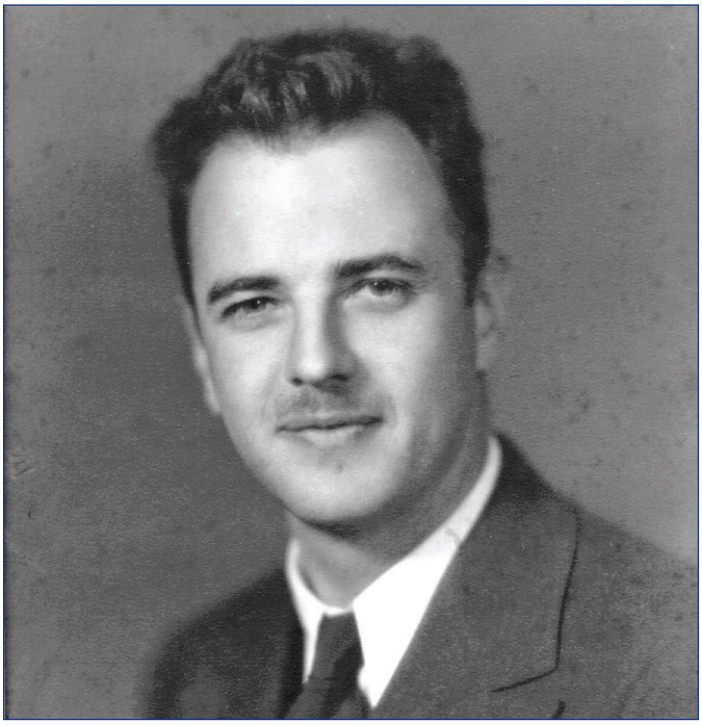

Figure 3. The research of Philip C. Wakeley of the Southern Forest Experiment Station established basic nursery and planting technology for southern pines. (Photo from Philip Wakeley family, 1935)

wing. Before noon, Bateman came by Wakeley's worksite and asked him to stop by the nursery. When he arrived, Bateman demonstrated a seeder for sowing longleaf pine seeds that he had developed that morning—a wooden trough, 5.0 ft (1.5 m) long to fit across nursery beds and hinged at the bottom to drop seeds on the bed. A pair of tall, curved handles at each end permitted it to be opened without stooping or kneeling, which made the device easy to use (figure 4). The seeder resulted in marked improvement in the uniformity and quality of longleaf pine nursery stock.

Refining Nursery and Reforestation Technology

The results of Wakeley's cooperative nursery research with the Great Southern Lumber Company were applied by other organizations interested in reforestation. Several forestry companies established small nurseries to evaluate the economic potential of reforestation. In 1929, Wakeley wrote a bulletin about the results of the cooperative seed, nursery, and planting research. He then surveyed six nurseries: Louisiana State University School of Forestry at Baton Rouge, LA; Louisiana Division of Forestry at Woodworth, LA; Industrial Lumber Company at Elizabeth, LA; Long Bell Lumber Company at DeRidder, LA; and the Texas Forest Service nurseries at Kirbyville and Conroe, TX. Wakeley found the nursery managers to be "observant, ingenious, and uninhibited men" (Wakeley and Barnett 2011: 82).

Charles Delaney and his brother Luther were managers of the Louisiana Department of Conservation, Division of Forestry nursery located on the Alexander State Forest near Woodworth, LA (figure 5), and frequently interacted with Wakeley to develop the South's first State tree-seedling nursery (Barnett and Burns 2011, 2012). The Texas Forest Service State nurseries followed soon thereafter.

Wakeley's collaboration with Johnson and Bateman ended in the early 1930s with the advent of the Great Depression and the demise of the Great Southern Lumber Company. During Wakeley's association with Great Southern, he developed information for seed collecting, processing, and treating and for seedling stock specifications and a variety of nursery cultural treatments. Thereafter, Wakeley's reforestation research program was moved to the Forest Service's new Stuart Nursery in central Louisiana.

In 1933, the Stuart Nursery was established by the Kisatchie National Forest (KNF) in central Louisiana in conjunction with the creation of the Civilian Conservation Corps (CCC). Although KNF employees managed the nursery, a nearby CCC camp of 200 young men provided labor for its operation (figure 6). Nursery production was about 25 million seedlings annually, with most of the seedlings shipped to CCC projects that had reforestation emphases. Wakeley's research, now located at the nursery, took advantage of the CCC crews to apply a variety of nursery cultural practices and to establish

Figure 4. This seeder, which F.O. (Red) Bateman developed for winged longleaf pine seeds, exemplifies his innovative skill. (Photo from USDA Forest Service files)

Figure 5. The Louisiana Department of Conservation, Division of Forestry nursery at the Alexander State Forest near Woodworth, LA, was the first State tree-seedling nursery in the South. Charles (left) and Luther Delaney (bent over) managed the nursery. (Photo from Louisiana Department of Agriculture and Forestry files)

Figure 6. The Kisatchie National Forest's Stuart Nursery in central Louisiana used Civilian Conservation Corps crews to operate the nursery. These crews grew and planted 670,000 seedlings in research studies. (Photo from USDA Forest Service files)

outplanting studies. Over the duration of the CCC involvement and support, nearly 750,000 tree seedlings were planted in research studies on the Palustris Experimental Forest (Barnett, Haywood, and Pearson 2011). The resources available at the Stuart Nursery facilitated the development of Wakeley's southern pine seedling grade specifications and other cultural guidelines that are still in use today throughout the South (Wakeley 1954).

By the end of the 1930s, Wakeley and his colleagues published guidelines for southern pine seed (Wakeley 1938a), seedling production (Huberman 1938, Wakeley 1938b), and planting technology (Wakeley 1935). Early versions of these publications were used by the organizations using CCC crews to grow seedlings for reforestation projects. Most of these CCC-related projects ended with the closure of the CCC program and the beginning of World War II (WWII). The availability of the CCC program provided an opportunity to field test seed, seedling, and planting research results, however, and pioneer reforestation guidelines for southern pines.

Modern Nurseries Across the South

After WWII, a concentrated effort was made to continue developing and applying reforestation technology. In 1954, Wakeley published *Planting the Southern Pines,* which incorporated results of the research programs with both the Great Southern Lumber Company and Stuart Nursery (Wakeley 1954). This single publication provided the modern foundation for southern pine nursery development and plantation establishment (figure 7).

Since Wakeley's publications, all Southern State forestry organizations and most major forestry companies have established nurseries. Few nurseries established before WWII remain in operation, however. The Stuart Nursery and W.W. Ashe Nursery in southern Mississippi continued operation for many years, but now are closed. The Soil Bank Program in the early 1960s did much to increase the demand for planting stock and expansion of nursery production. In the late 1970s and early 1980s, reforestation programs and nursery production of forest industries expanded even further so that large portions of nursery production shifted from Federal- and State-operated nurseries to commercially operated forest industry nurseries.

Although many refinements and improvements have been made in nursery technology during the past 75 years, the basic guidelines that Wakeley and his colleagues developed in the early 20th century remain as the foundation for today's southern nursery and reforestation programs (figure 8).

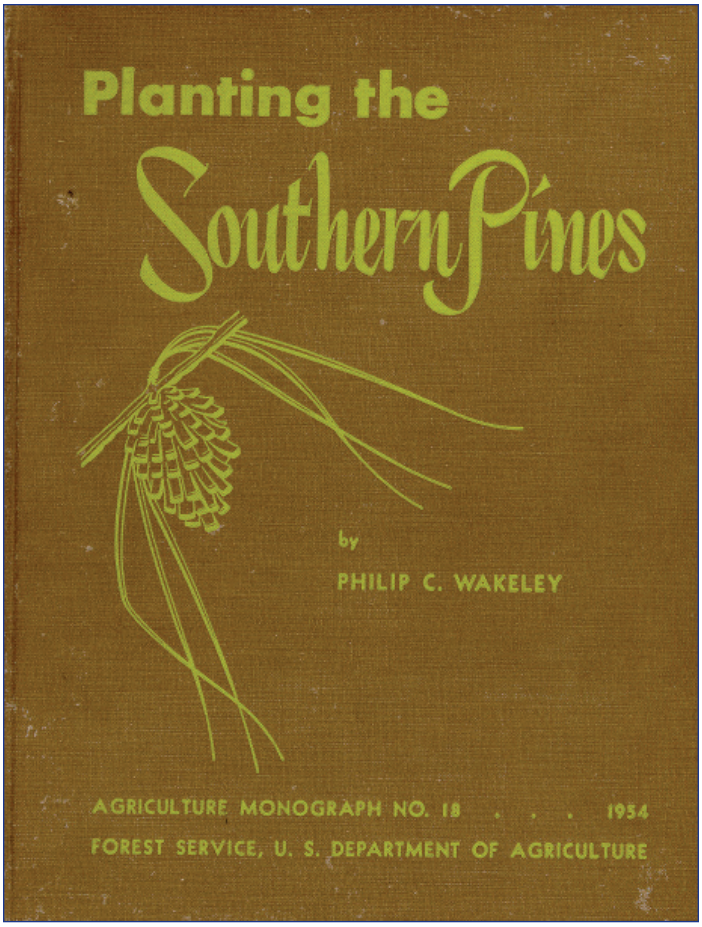

Figure 7. Wakeley's 1954 book, *Planting the Southern Pines*, provided the knowledge and technology for operating nurseries and establishing pine plantations across the South. (Photo by James Barnett, 2010)

Figure 8. This longleaf pine plantation was established as a research study by Wakeley in the winter of 1934 to 1935. (Photo by James Barnett, 2012)

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